

# EMERGENCY ACTION PLAN

for

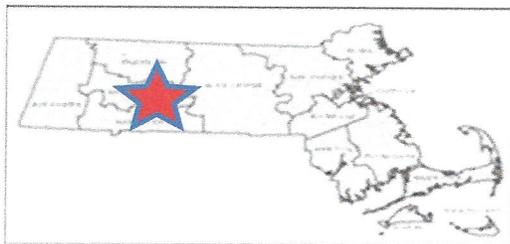
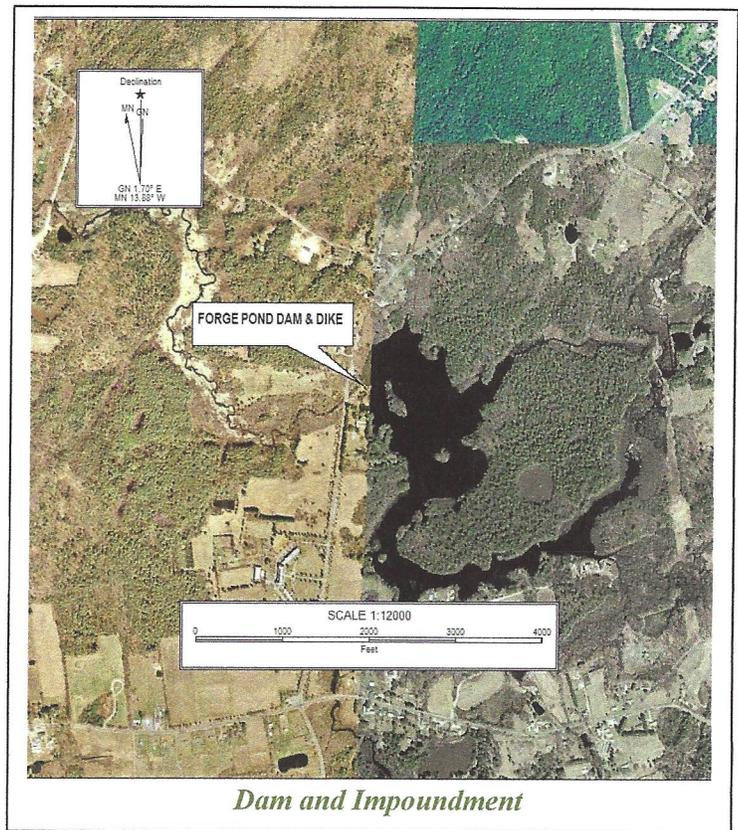
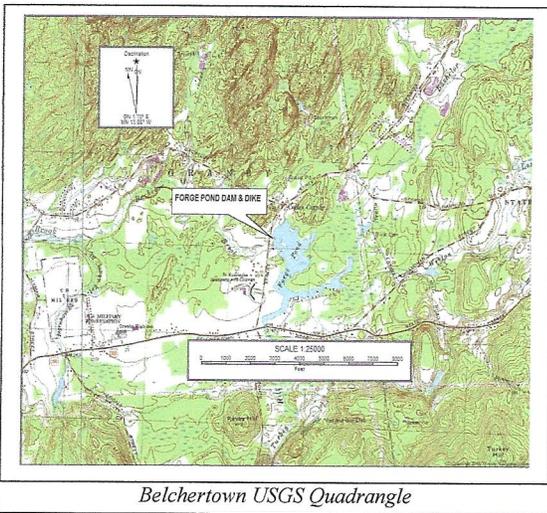
# FORGE POND DAM & DIKE

**GRANBY, HAMPSHIRE COUNTY, MASSACHUSETTS**

National I.D. Number: MA00488/MA00489

State ID Number: 2-8-111-2/2-8-111-3

Dam Location: 42.274511°N/-72.47085°W



<b>Dam Owner:</b>	<b>Dam Caretaker:</b>
Town of Granby Board of Selectmen Senior Center Building – 2nd Floor 10-B West State Street Granby, MA 01033 Phone: 413-467-7177	Town of Granby Department of Public Works Director of Public Works 15 Crescent Street Granby, MA 01033 Daytime Phone: 413-467-7575

PROJECT

Emergency Action Plan

Re: Forge Pond Dam & Dike MA00488/MA00489

The following verification of EAP review is required under MGL Chapter 253 and 302 CMR 10.0. This verification of review is to become a part of the Emergency Action Plan and is to accompany the Plan copies submitted to the Department of Conservation and Recreation, Office of Dam Safety and the Massachusetts Emergency Management Agency. The purpose of this verification is to document that the local Emergency Management Director has received and reviewed a draft copy of the Plans.

Signing of this document by the local Emergency Management Director acknowledges that the above described review process has taken place.

EMERGENCY MANAGEMENT DIRECTOR

Name: CHRISTOPHER MARTIN

Title: DIRECTOR OF EMERGENCY MANAGEMENT

Signature: 

Date: 11/08/2019

EAP 2019

# FORGE POND DAM

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## PREAMBLE

This Emergency Action Plan was prepared for the Town of Granby, Owner of the Forge Pond Dam & Dike (Dam) in accordance with the Commonwealth of Massachusetts General Laws, M.G.L. 253, Section 44, Chapter 302 C.M.R. 10.00, “Dam Safety, dated February 10, 2017” to establish a basic plan of action if conditions at the dam indicate the potential for dam failure or if any individual observes and reports that a dangerous condition is developing at the dam. The development of this EAP has been primarily based on the Federal Emergency Management Agency (FEMA) “Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners,” dated October 1998, the Federal Energy Regulatory Commission (FERC) “Emergency Action Plan Guidelines,” dated November 1998, 2006 NRCS recommendations for developing EAPs, and other publicly available EAP templates from state dam safety programs.

The purpose of this plan is to define responsibilities and provide procedures for identifying unusual and unlikely conditions, which may endanger the Forge Pond Dam and infrastructure downstream of the dam, in time to take mitigated action and to notify the appropriate emergency management officials of possible, impending, or actual failure of the dam in order to minimize property damage and loss of life.

This Emergency Action Plan should not be viewed as a substitute for implementing standard dam maintenance, inspections and repairs in accordance with good dam operations.

It is important to note that the condition of the dam depends on numerous and constantly changing internal conditions and is evolutionary in nature. It would be incorrect to assume that the condition of the dam will remain the same over time. Only through continued care and inspection can there be any chance of detecting unsafe conditions before they result in an emergency condition.

The EAP is housed in a three-ring binder to easily facilitate updates to the plan. The EAP should be updated and exercised annually to ensure that the information is current. Most importantly, the names and telephone numbers of emergency response personnel listed in the Notification Flowchart shall be updated periodically. The general layout of an emergency response is as follows:

## **NOTIFICATION FLOWCHART**

EMERGENCY LEVEL NOTIFICATIONS

EMERGENCY EVENT

DAM OPERATOR'S REPRESENTATIVE

FORGE POND DAM & DIKE  
DAM CARETAKER  
DIRECTOR OF PUBLIC WORKS  
TEL. 413-467-7575

MEMA - HEADQUARTERS  
FRAMINGHAM

TEL. 508-820-2000

NATIONAL WEATHER SERVICE

TEL. 508--823-1983

EMERGENCY ALERT SERVICE

TEL. 508-824-2100

NOAA WX RADIO  
TV/RADIO  
TEL. 508--828-2672

GRANBY  
EMERGENCY MANAGEMENT  
DIRECTOR

TEL. 413-467-9595

GRANBY FIRE CHIEF

911 (EMERGENCY)

TEL. 413-467-9696

GRANBY POLICE CHIEF

911 (EMERGENCY)

TEL. 413-467-9222

DAM SAFETY OFFICIAL  
MASSACHUSETTS DCR  
OFFICE OF DAM SAFETY

WILLIAM SALOMAA  
TEL. 617-626-1410 (Office)  
TEL. 617-719-1942 (Cell)

MASSACHUSETTS  
STATE POLICE

BELCHERTOWN BARRACKS

TEL. 413-323-7561

GRANBY HIGHWAY DEPT.  
DPW DIRECTOR

TEL. 413-467-7575

DAM OWNER'S  
TECHNICAL REPRESENTATIVE

LENART CONSULTING SERVICE, LLC  
DAVID M. LENART, P.E.  
TEL. 413-535-5754 (Office)  
TEL. 413-592-1289 (Alternate)

PHASE I

NOTIFICATION PATH IF FAILURE  
IS NOT IMMINENT. (CONDITION B)

PHASE II

NOTIFICATION PATH IF FAILURE  
IS IMMINENT OR OCCURRED  
(CONDITION A)

INCLUDES PHASE I

## 1.0 NOTIFICATION PROCEDURES

### 1.1 Notification Flowchart

The Notification Flowchart preceding this section indicates that chain of communication to be followed in the event of an Emergency. The Notification Flowchart indicates a Phase I and Phase II type of notification to be implemented depending on the emergency classification level (Emergency Condition Watch or Dam Failure Warning) as determined necessary based upon the judgment of the personnel monitoring the emergency condition at the dam (see Appendix B for additional descriptions).

- **Dam Safety Watch: “Potential failure is developing”**: This is a situation where a failure may eventually occur if left unattended. This situation will require a Phase I response with continuous monitoring of the situation.
- **Dam Failure Warning: “Failure is Imminent or has occurred”**: This is a situation where a failure either has occurred, is occurring, or is just about to occur. This situation will require Phase I and II responses that will proceed with evacuation procedures.

During the highest emergency level (Dam Failure Warning), procedures are to evacuate the downstream residents using a combination of the telephone, augmented by police cruising the area broadcasting the evacuation message and going door to door to homes that cannot be reached by telephone. To ease this burden somewhat, the National Weather Service can be alerted at (508) 823-1983 and they will make a general broadcast about the evacuation over the airways. *The National Weather Service will call the Fire Department to verify the emergency. Therefore, the Fire Department should be called before the National Weather Service is contacted. MEMA can also be contacted to activate the Emergency Alert Service.*

The flowchart should be updated yearly to account for local or state personnel changes. Any new personnel should be informed and trained to perform their responsibilities under this plan.

This Notification Flowchart is contained within the opening pages of this document.

### 1.2 Emergency Notification Template

Once the emergency condition has been identified, and the appropriate response level has been determined, the following template can be used as a guide for notification announcements:

“This is (your name, title, affiliation)

You are being contacted per the Emergency Action Plan for the Forge Pond Dam.

Please be advised: A Dam (Dam Safety / Warning / Watch) condition has been identified at the Forge Pond Dam.

The observation was made at (time and date)

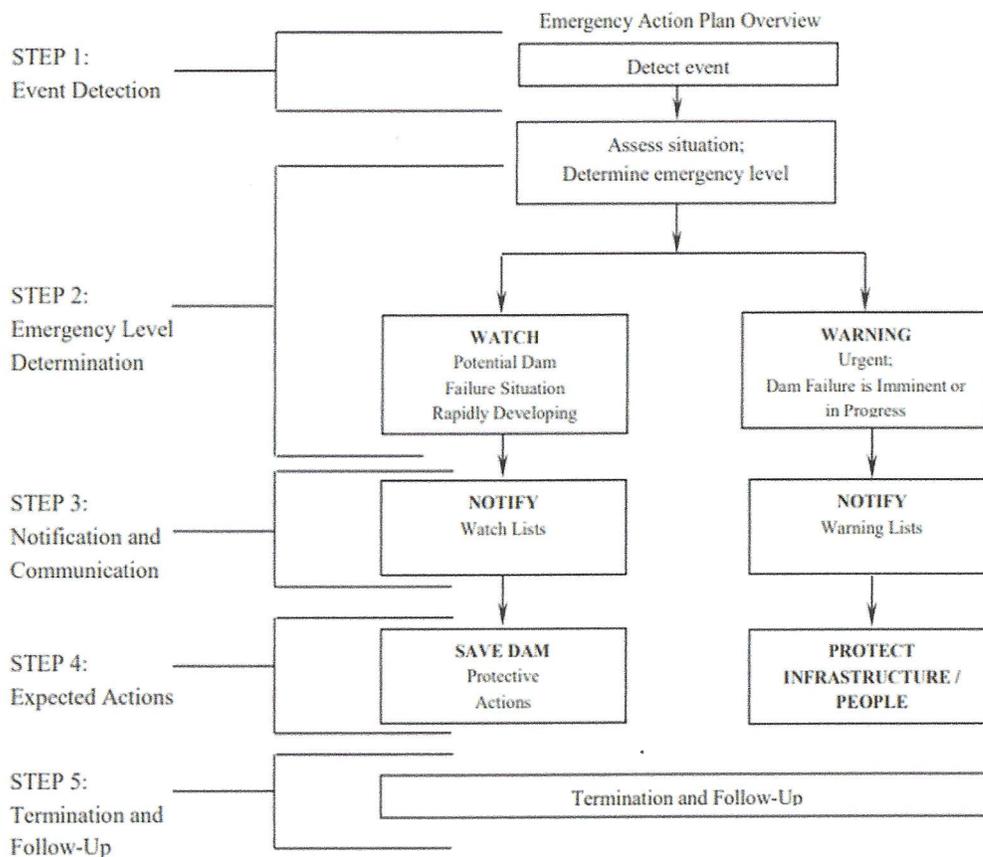
The situation is (provided brief description)

It is recommended that (Remain on alert; Prepare for Evacuation; Evacuate the area and move to higher ground)”

### 1.3 Impact Summary / Road Closures

The downstream flooding from failure of Forge Pond Dam was estimated by Lenart Consulting Service, LLC using Simplified Dam Break (SMPDBK) software (see Section 4.0). Based on the analysis, the downstream flooding is expected to impact portions of the Town of Granby along Batchelor Brook. The estimated peak flow through the dam breach is 3,430 cfs. See Section 4.0 for an inundation map as well as more information on roadways and buildings in the downstream inundation zone.

### 1.4 General Response Flowchart



## 2.0 PROJECT DESCRIPTION

Dam Name: Forge Pond Dam  
 STATE-ID#: 2-8-111-2  
 City/Town: Granby  
 Size Classification: Intermediate

Hazard Classification: Significant  
 Federal ID (NID): MA00488  
 County: Hampshire

Location: Forge Pond Dam is located on Forge Pond in the Town of Granby, Massachusetts in Hampshire County. The dam location is shown on the USGS quadrangle map at coordinates 42.274511, -72.470850.

Access: Access to the dam is from School Street. See Figure 1 and 2, the USGS site locus map and an aerial photograph site locus appended to this report in the Figures section.

The following information pertains to the dam as identified as MA00488. The dam and dike are considered the dam.

Lot No: B-6	Block No: 14
Latitude: 42.274511°N	Longitude: -72.470850°W
River/Stream/River Basin: Bachelor Brook	Nearest City/Town: Granby
Quad Sheet: Belchertown, MA	Normal Surface Area (ac): 72
Hydraulic/Structural Height (ft.): 11.0 / 13.5	Normal Storage (ac-ft.): 380
Embankment Length (ft): 115	Maximum Storage (ac-ft.): 600
Dam Type: Earthen Embankment w/ concrete/masonry spillway	
Spillway Type: Broad-crested weir, concrete and stone masonry	
Type of Dike: N/A	Spillway Capacity (cfs): 1,005
Outlet Type (other than spillway): 36" Sluice Gate	Drainage Area (sq. mi.): 14.2 Year
Built: 1900	Last Rehabilitation: 1978

Purpose/Operation of Dam (attach additional sheets if necessary): Recreation

Instrumentation (if any): None

Upstream Dams: None

Downstream Dams: Aldrich Lake Dam

Description of Inundation Area and Downstream Hazards: Based on the analysis, the downstream flooding is expected to impact portions of the Town of Granby along Bachelor Brook including School Street, Trompke Avenue, North Street, Porter Street, one private residence and one business.

Method of emergency drawdown: 36" Sluice Gate

### 3.0 GENERAL RESPONSIBILITIES

#### 3.1 Summary of Responsibilities

Entity	Responsibilities
<p><b>Dam Owner:</b> Town of Granby, Board of Selectmen Senior Center Building – 2nd Flr. 10-B West State Street Granby, MA 01033 Phone: 413-467-7177</p> <p><b>Dam Caretaker:</b> Granby Dept. of Public Works 15 Crescent Street Granby, MA Phone: 413-467-7575</p>	<ol style="list-style-type: none"> <li>1. Notify local authorities. Upon receiving report of an incident, contact the Emergency Management Director (EMD) and identify the report.</li> <li>2. Evaluate the extent/nature/severity of the incident. Update the EMD as to the need to implement the EAP.</li> <li>3. Monitor the situation at the dam for the duration of the emergency. Update the EMD and other local and state authorities of developing conditions at the dam for the duration of the emergency situation.</li> </ol>
<p><b>Local Emergency Management:</b> Granby Emergency Management Director Phone: 413-467-9595</p> <p><b>Or 9-1-1</b></p>	<ol style="list-style-type: none"> <li>1. Contact and warn population in area of potential impacts; Coordinate efforts with other parties involved in the EAP as necessary.</li> <li>2. The EMD/Incident Commander will serve as the contact point for disseminating all updates concerning the condition of the emergency.</li> </ol>
<p><b>Local Fire Department:</b> Granby Fire Chief Phone: 413-467-9696</p> <p><b>or 9-1-1</b></p>	<ol style="list-style-type: none"> <li>1. Assist in the evacuation of special needs and/or elderly citizens.</li> <li>2. Provide additional evacuation support as needed.</li> <li>3. Assist EMD as needed.</li> </ol>
<p><b>Local Police Department:</b> Granby Police Chief Phone: 413-467-9222</p> <p><b>or 9-1-1</b></p>	<ol style="list-style-type: none"> <li>1. Assist in securing the site and implementing evacuation if necessary (i.e. coordinating barricades, street closures, traffic flow).</li> <li>2. Utilize appropriate and/or necessary evacuation procedures, which may include but are not limited to, multilingual broadcasts, slow-speed broadcasts, and coordinated efforts with other emergency responders.</li> </ol>
<p><b>Massachusetts Emergency Management Agency (MEMA)</b> 24 hrs: 508.820.2000</p>	<ol style="list-style-type: none"> <li>1. Coordinate broadcast notification as <u>requested</u> by the local Fire/Police/EMD.</li> <li>2. Mobilize necessary equipment as <u>requested</u> by the local Police/Fire/EMD.</li> </ol>
<p><b>Massachusetts State Police</b> Belchertown Barracks 24 hrs: 413-323-7561</p>	<ol style="list-style-type: none"> <li>1. Assist in securing the site, implementing evacuation, and controlling traffic flow in and out of the impacted area as <u>requested</u> by the local Police Department.</li> </ol>

### **Emergency Response Coordination**

During an emergency situation, Emergency Management Director [Incident Commander] will be responsible for the proper organization and operation of the Emergency Action Plan. He/she will coordinate all activities with state and local authorities.

## 4.0 INUNDATION MAPS

### 4.1 Inundation Map Development

To evaluate the extent of downstream flooding due to a failure of Forge Pond Dam, Lenart Consulting performed a simulation of a dam break using the Simplified Dam Break (SMPDBK) software, developed by the National Weather Service (NWS) and made available by the RiverMechanics Group.

Inputs to the program include the length and height of the structure, reservoir volume, reservoir storage area, the dam breach parameters, downstream cross-section and Manning's N values for each downstream reach. Outputs from the program include the flood zone, peak flow, maximum depth at downstream locations, and the arrival time of the flood waters.

The input parameters used for the model are listed below. Note that this is a hypothetical estimate and an actual breach may have different characteristics.

- Type of Dam: Concrete and masonry spillway and vertical stone masonry wall on the downstream side
- Dam Breach Elevation (ft, NAVD88): 273.5 (at top of dam)
- Storage Volume at Failure (acre-ft): 380
- Surface Area of Reservoir (acres): 72
- Final Breach Width (ft): 30
- Time to Failure (min): 60
- Final Breach Elevation (ft, NAVD88): 260
- Antecedent Flow Through Dam: None
- Antecedent Downstream Flooding: None
- Failure Mode-Overtopping

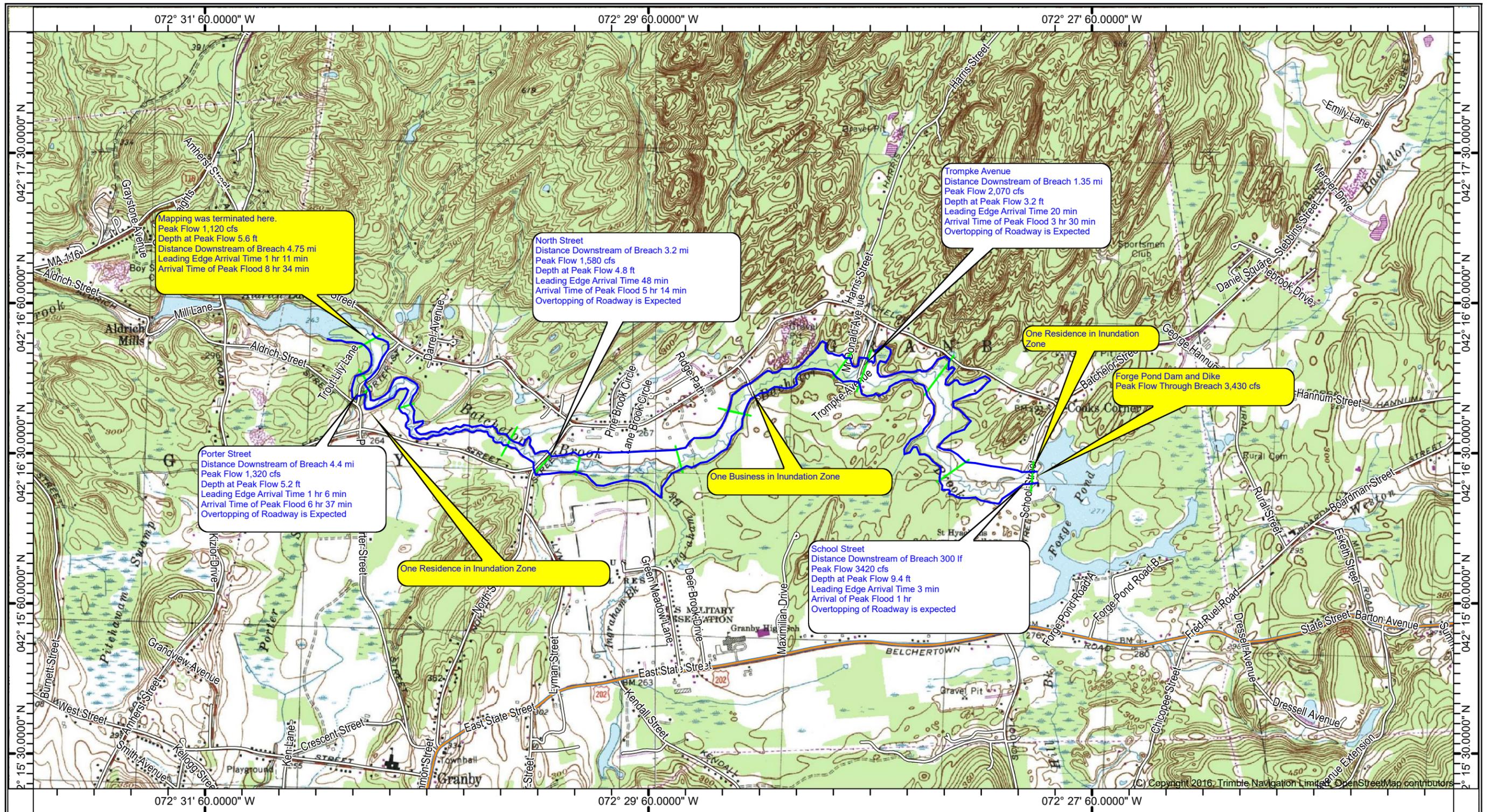
Note that the inundation zone from the dam failure may be affected by antecedent flooding (i.e. flooding from rainfall) and downstream bridges and dams. Lenart Consulting Service, LLC's simulation does not include antecedent flooding in the downstream area. Downstream bridges and dams are represented in the model by the terrain. If the terrain data did not capture the bridge opening, the simulation assumes the bridge is blocked.

### 4.2 Impacted Area Summary

The estimated peak flow through the dam breach is 3,430 cfs. The impacted area is shown on the Inundation Map following.

Based on the analysis, the downstream flooding is expected to impact portions of the Town of Granby along Batchelor Brook including School Street, Trompke Avenue, North Street, Porter Streetone private residence and one business.

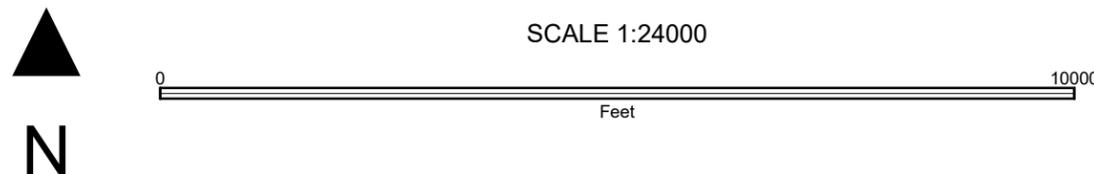
Note that roadways that are in the inundation zone but not overtopped should be used with caution. The dam breach flood wave may still adversely affect these roadways (e.g., by scour / erosion) and travel along roadways above the flood wave is not recommended or should be monitored.



Map Name: BELCHERTOWN  
 Map Type: Topographic  
 Print Date: 09/24/19  
 Horizontal Datum: NAD83

— Cross Section Location  
 — Boundary for area flooded by dam failure.

SCALE 1:24000

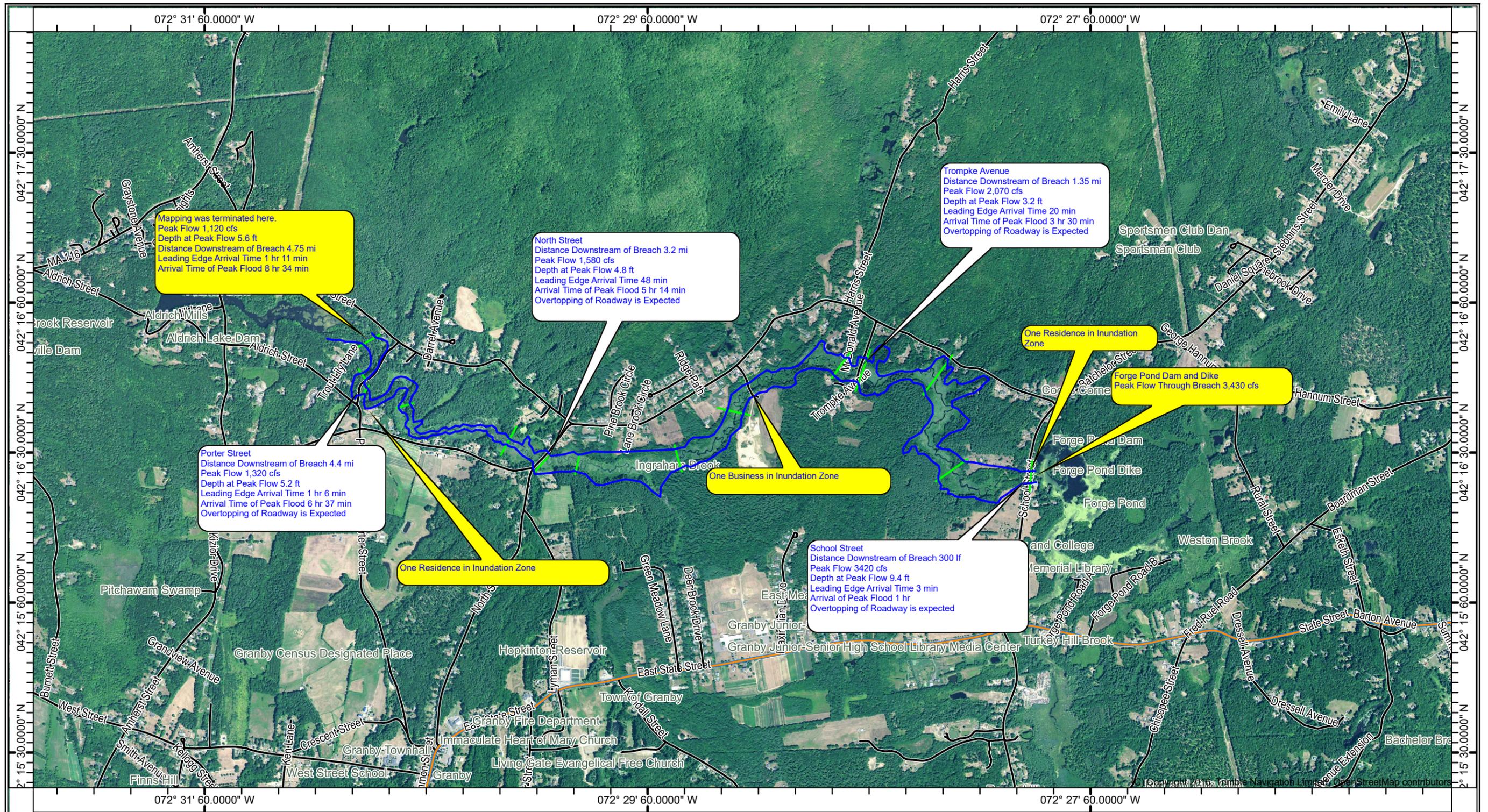


Notes:

1. The inundation area shown on this map is approximate and should be used as a guide to establish evacuation zones.
2. The inundation area from an actual dam/dike failure will depend on failure conditions and may differ from this map.
3. The results shown are not intended to reflect on the integrity of the Forge Pond Dam and Dike.
4. Dam and Dike failure was simulated with impoundment elevation at top of dam and without antecedent downstream flooding

**INUNDATION MAP FOR  
 FORGE POND DAM AND DIKE  
 GRANBY, Massachusetts**

**Lenart Consulting Service, LLC**



Mapping was terminated here.  
 Peak Flow 1,120 cfs  
 Depth at Peak Flow 5.6 ft  
 Distance Downstream of Breach 4.75 mi  
 Leading Edge Arrival Time 1 hr 11 min  
 Arrival Time of Peak Flood 8 hr 34 min

North Street  
 Distance Downstream of Breach 3.2 mi  
 Peak Flow 1,580 cfs  
 Depth at Peak Flow 4.8 ft  
 Leading Edge Arrival Time 48 min  
 Arrival Time of Peak Flood 5 hr 14 min  
 Overtopping of Roadway is Expected

Trompke Avenue  
 Distance Downstream of Breach 1.35 mi  
 Peak Flow 2,070 cfs  
 Depth at Peak Flow 3.2 ft  
 Leading Edge Arrival Time 20 min  
 Arrival Time of Peak Flood 3 hr 30 min  
 Overtopping of Roadway is Expected

Porter Street  
 Distance Downstream of Breach 4.4 mi  
 Peak Flow 1,320 cfs  
 Depth at Peak Flow 5.2 ft  
 Leading Edge Arrival Time 1 hr 6 min  
 Arrival Time of Peak Flood 6 hr 37 min  
 Overtopping of Roadway is Expected

School Street  
 Distance Downstream of Breach 300 ft  
 Peak Flow 3420 cfs  
 Depth at Peak Flow 9.4 ft  
 Leading Edge Arrival Time 3 min  
 Arrival of Peak Flood 1 hr  
 Overtopping of Roadway is expected

Forge Pond Dam and Dike  
 Peak Flow Through Breach 3,430 cfs

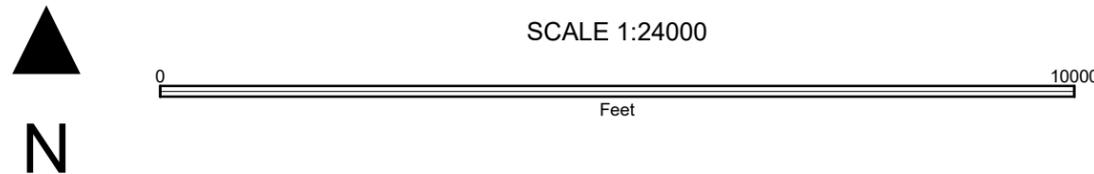
One Residence in Inundation Zone

One Business in Inundation Zone

One Residence in Inundation Zone

Map Name: Satellite Image (Hybrid Street)  
 Map Type: Aerial Photo  
 Print Date: 09/24/19  
 Horizontal Datum: NAD83

— Cross Section Location  
 — Boundary for area flooded by dam failure.



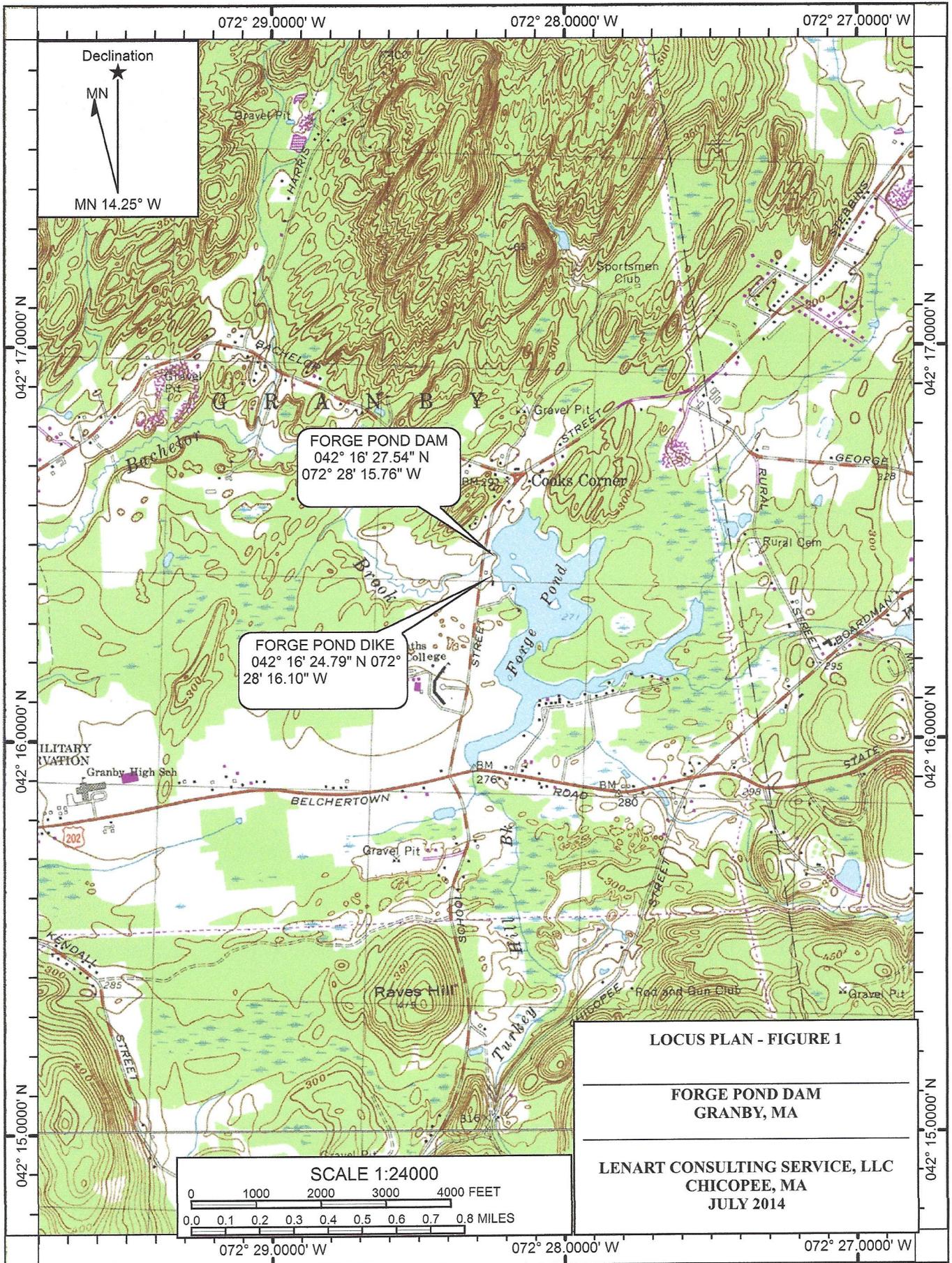
Notes:

1. The inundation area shown on this map is approximate and should be used as a guide to establish evacuation zones.
2. The inundation area from an actual dam/dike failure will depend on failure conditions and may differ from this map.
3. The results shown are not intended to reflect on the integrity of the Forge Pond Dam and Dike.
4. Dam and Dike failure was simulated with impoundment elevation at top of dam and without antecedent downstream flooding

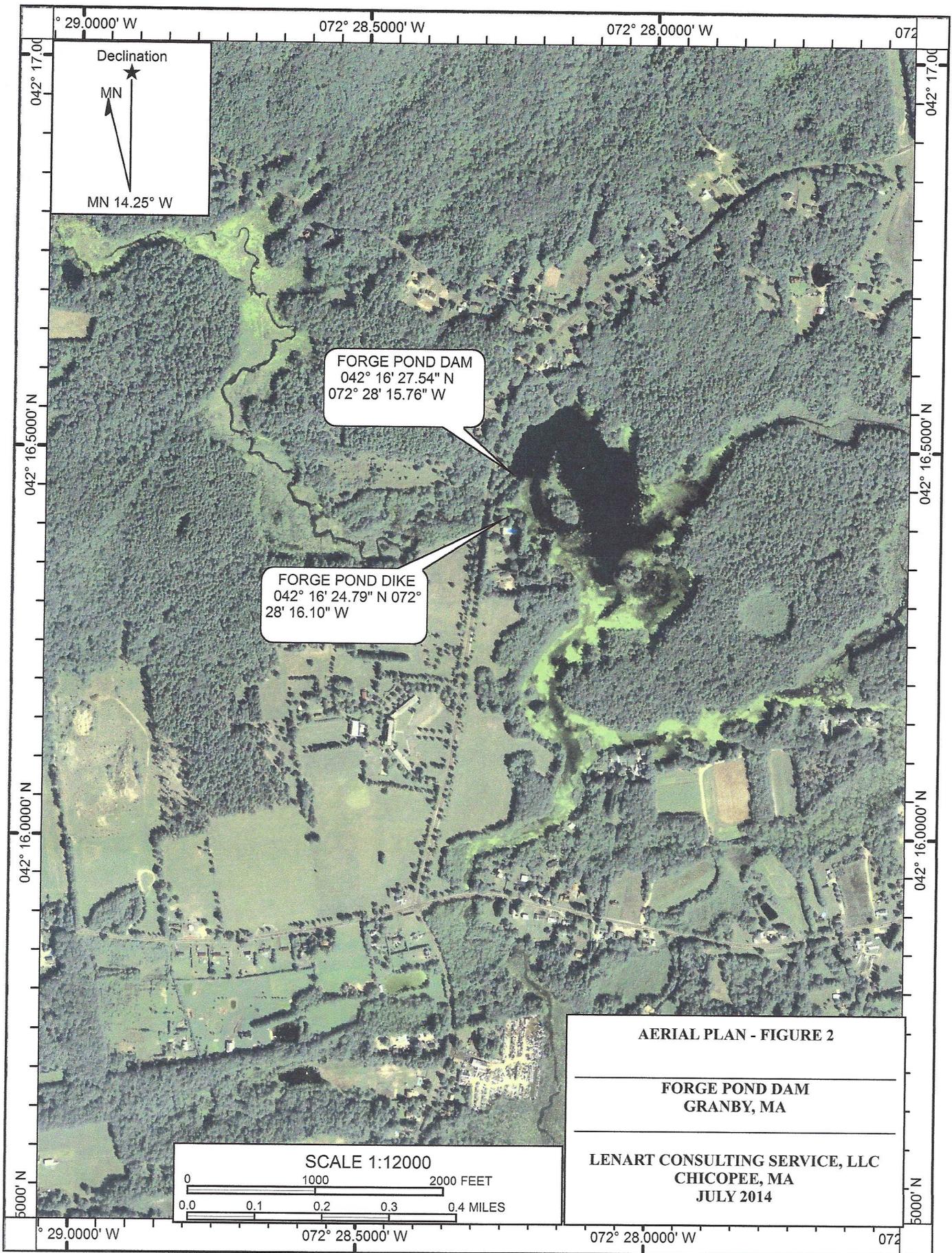
**INUNDATION MAP FOR FORGE POND DAM AND DIKE GRANBY, Massachusetts**

**Lenart Consulting Service, LLC**

## **FIGURES**



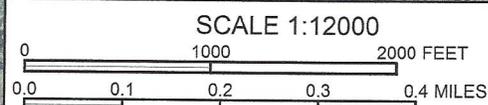
USGS Quadrangle: BELCHERTOWN

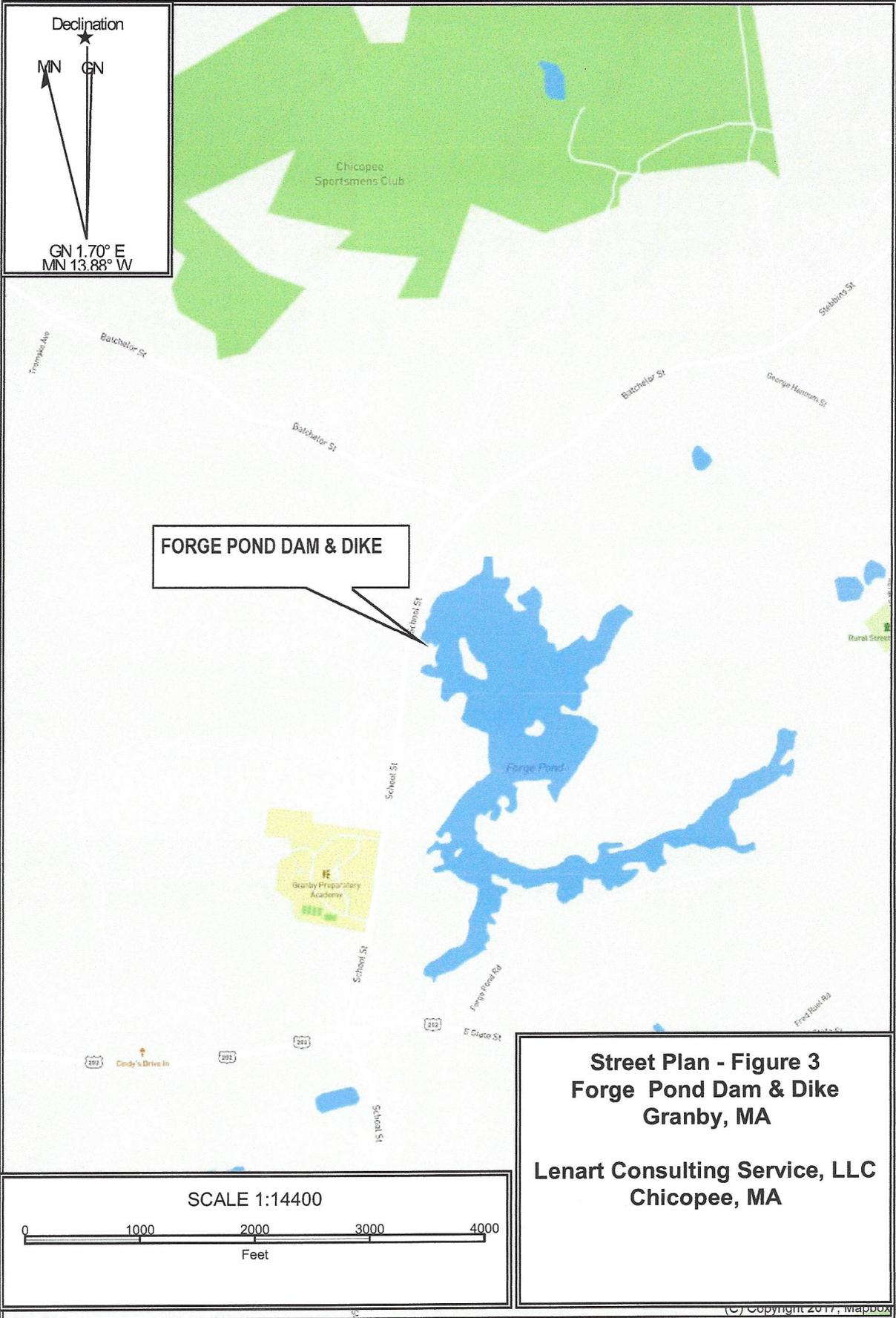


AERIAL PLAN - FIGURE 2

FORGE POND DAM  
GRANBY, MA

LENART CONSULTING SERVICE, LLC  
CHICOPEE, MA  
JULY 2014





Declination

MIN GN

GN 1.70° E  
MN 13.88° W

Chicopee Sportsmens Club

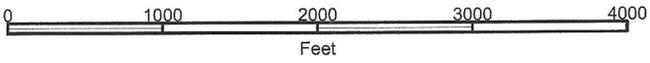
FORGE POND DAM & DIKE

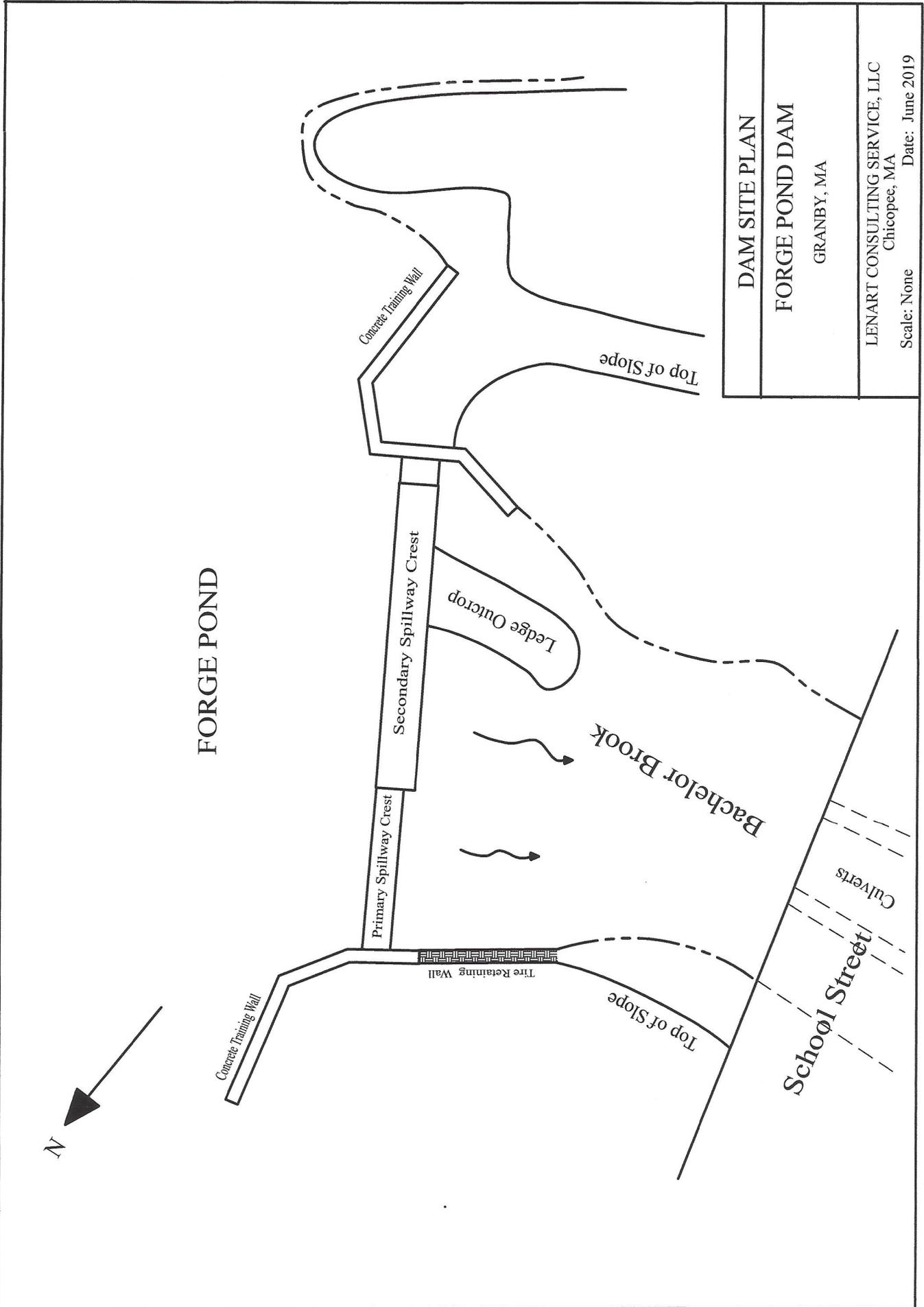
Granby Preparatory Academy

**Street Plan - Figure 3  
Forge Pond Dam & Dike  
Granby, MA**

**Lenart Consulting Service, LLC  
Chicopee, MA**

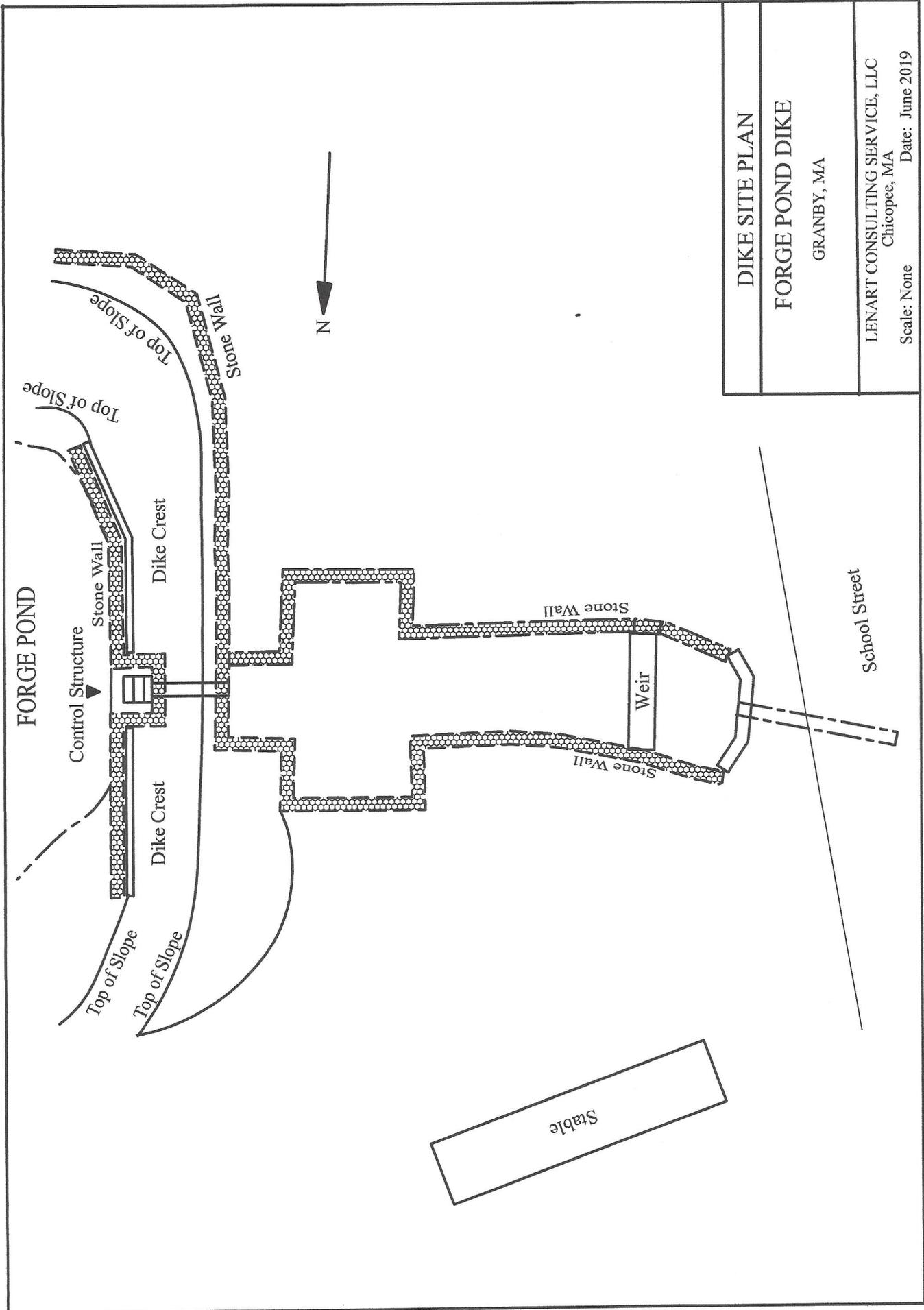
SCALE 1:14400





**FORGE POND**

<b>DAM SITE PLAN</b>
<b>FORGE POND DAM</b>
GRANBY, MA
LENART CONSULTING SERVICE, LLC Chicopee, MA
Scale: None      Date: June 2019



DIKE SITE PLAN
FORGE POND DIKE
GRANBY, MA
LENART CONSULTING SERVICE, LLC Chicopee, MA
Scale: None      Date: June 2019

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**Appendix A**  
**Preparedness**

## **PREPAREDNESS**

Preparedness actions are taken to prevent an emergency situation from developing or to minimize the extent of damage caused from a developed emergency situation. The preparedness actions may be by providing response procedures to emergency situations and/or arranging for equipment, labor, and materials for use in emergency situations.

### **Surveillance**

The most important step to activating an EAP is the identification of a problem at the dam. If a problem is not identified, the plan cannot be implemented. Problem identification will be much easier if knowledgeable personnel regularly monitor the dam closely.

The dam owner and dam operator must continue to monitor the dam on a regular basis. This is especially important during high rainfall events and during spring runoff conditions when large amounts of snow melting occur. Appendix B identifies some potential hazards that could lead to dam failure. The Town of Granby Department of Public Works is currently responsible for implementing operational and maintenance activities for the dam.

It is impossible to predict when an emergency situation will develop, therefore it is important that emergency contact information be posted at the site so that a casual observer can contact emergency personnel if they observe an unusual condition.

### **Access to Site**

Access to the dam is from School Street.

### **Operations and Maintenance Manual**

Forge Pond Dam does not have a current operation and maintenance plan.

### **Response during Periods of Darkness**

There is no lighting equipment at Forge Pond Dam.

The embankment, spillway, low level outlet and any distressed areas of the dam should be illuminated if an emergency condition develops during period of darkness. This will allow the emergency condition to be monitored, assessed, and help facilitate a response. Lighting (e.g. portable light towers) is available for use by town and state agencies through MEMA. Emergency power and remote lighting contingencies may be available from local rental companies, such as United Rentals, 562 Holyoke Street, Ludlow, MA 413-589-7876.

### **Response during Evenings, Weekends, and Holidays**

The Notification Flowchart can be used for evenings, weekends, and holidays. When practical, redundancies of personnel and alternate telephone contact numbers have been provided.

## **Response during Periods of Adverse Weather**

Undoubtedly, personnel from the Department of Public Works and the local and state emergency management will be in a heightened state of readiness in the event of predicted or actual adverse weather conditions. The dam is easily accessible by town and other emergency personnel via School Street.

## **Training and Testing**

Training and testing of the EAP is the responsibility of the dam owner. The dam owner should coordinate training and testing with local responders and emergency personnel within the municipalities impacted by a dam failure. Training/orientation seminars should be held for all operators, attendants and other personnel (i.e. police and fire) responsible for the implementation of the plan. After the initial training seminar, it is recommended that a special meeting be held to explain the plan to the downstream residents and elected officials. The meeting with downstream residents will be extremely beneficial at a time of emergency.

It is recommended that the EAP or components of the plan be tested periodically. The testing should be conducted through the use of communication drills and table-top exercises. Testing should include operators, attendants, police, fire and other personnel responsible for the implementation of the plan. Downstream residents shall not be included in the test.

Below is a list of suggested training exercises, the frequencies they should be conducted, and the topics they should cover:

### Seminars with Emergency Personnel

- Frequency: As needed
- Topics:
  - New hires should be briefed on their duties during an emergency response.
  - At a minimum a read through of the EAP and a brief assessment should be conducted.

### Emergency Management Workshop

- Frequency: Annually
- Attendees: Selectmen, Caretaker, Town of Granby Emergency Management, MEMA, State Police
- Topics:
  - Authorities responsible for executing the EAP should gather to discuss the EAP.
  - Review and updating of the Notification Flowchart, Emergency Contacts, and Emergency Warning systems should be conducted at this time.
  - Parties should discuss the response effort (specifically the Notification Flowchart) and the corrective actions to be taken at the dam during various scenarios.
  - Lines of communication should be streamlined such that a developing condition at the dam can be assessed and handled.

### Public Meetings

- Frequency: Every 2 Years
- Topics:
  - The public should be educated on the EAP and how they can facilitate the rapid and safe execution of the EAP during an emergency.
  - Evacuation routes should be discussed.
  - Emergency Warning systems for alerting the public (i.e. Connect-CTY, CodeRED) should be discussed and updated.
  - Preparation and situational awareness techniques during an emergency situation should be discussed. (i.e. Areas of high ground within the town, keeping a cell phone charged, supplies needed for an extended evacuation, navigation of flooded roads, etc.)

### Table Top Exercise

- Frequency: Every 3-4 Years
- Topics:
  - Emergency management personnel should gather and discuss different emergency scenarios to assess plans, policies, and procedures.

### Functional Exercise

- Frequency: Every 5 Years
- Topics:
  - A functional exercise is conducted to test and validate the coordination, command, and control between the Selectmen, Caretaker, EMD, and all agencies involved with carrying out the EAP.
  - This type of exercise does not include any “boots on the ground”.

After each of the tests mentioned above, a “lessons learned: discussion and evaluation should be conducted. The discussions should highlight procedures that work well and those that did not; as well as inaccurate information (within the flowchart, inundation maps, resident contacts, assigned responsibilities, equipment, etc.). Results should be written down and distributed to the associated parties and any corrections and updates should be made.

The training and testing activities should be fully documented.

### Updating and Posting

All aspects of the EAP should be reviewed and updated once per year. The Town of Granby is responsible for coordinating the review and updates for this EAP.

During the review, a determination of any new developments or other changes downstream or elsewhere should be made to determine whether any revisions to the current EAP are necessary. It is imperative that all other holders of the EAP receive updates to the EAP immediately upon becoming aware of necessary changes to keep the EAP workable. This includes revisions when

phone numbers and/or names change for Notification Flowchart personnel and downstream residents.

An up-to-date copy of the flowchart and notification list should be in prominent locations in the offices of the personnel responsible for the EAP implementation.

A copy of the complete up-to-date EAP should also be available to all operators and personnel responsible for the implementation of the EAP. At a minimum, a full copy of the EAP should be located at the following locations:

- Owner: Town of Granby, Senior Center Building – 2nd Floor 10-B West State Street, Granby, MA.
- Local Emergency Management Director: Chris Martin, 5 Carlisle Avenue, Granby, MA 01033.
- Massachusetts Emergency Management Agency (MEMA): 400 Worcester Road, Framingham, MA 01702
- Massachusetts Department of Conservation and Recreation, Office of Dam Safety: William Salomaa, Director, 251 Causeway Street, Boston, MA 02114

### **Emergency Response Coordination**

During an emergency situation, the **Incident Commander** will likely be the Granby Emergency Management Director. He will be responsible for the proper organization and operation of the Emergency Action Plan. He will coordinate all activities with state and local authorities.

### **Contact Lists**

Contact lists should be maintained for facilities, structures, and other properties that may be impacted by a flood wave. Dependent upon the nature of the inundated area, the contact lists may include residents to be evacuated due to shallow flooding, facilities requiring special considerations, and other facilities. Contact lists should also consider special needs in the impacted area such as multilingual communications.

Hard copies of the list should be kept within each EAP binder. At a minimum, annual reviews and updating of the contact list should be completed to keep the list current.

A form for filling in contact information is provided at the end of this Appendix.

### **Alternative Systems of Communication**

If there is an interruption in telephone service during an emergency condition, emergency response personnel should broadcast over their radio communications system and cellular phones as necessary. Cell phone/telephone numbers for the emergency responders should be maintained and updated in the notification flowchart on a regular basis. Notifying the public can be accomplished with Reverse 911 systems (such as Connect-CTY or CodeRED), patrol cars, door to door, social media (Facebook, Twitter), and roadside message boards.

## Emergency Labor, Supplies and Equipment

Once an emergency condition has been identified, mobilization of the appropriate equipment is key to addressing the situation. The following lists provide partial equipment lists for the conditions described above. This list should be modified as required to address actual conditions at the time of the emergency. Additional equipment, not listed below, may be necessary. The actual condition and estimated response time versus the rate of deterioration of the dam may preclude the repair of the structure and necessitate full evacuation. The primary goal is to protect human life and minimize property damage.

- Emergency lights and generators for dam work or evacuation
- Construction equipment if the dam is repairable
- Loaders
- Excavators
- Gravel hauling trucks
- High wheel trucks
- Sandbags
- Shovels
- Tree removal equipment
- Barriers, barricades and personnel transportation to facilitate evacuation

***The provision of labor, equipment and materials is the responsibility of the dam owner.*** As such the following sections provide recommendations for establishing relationships and agreements with local contractors, vendors, and suppliers.

### Subcontractors

The Town of Granby should develop/maintain open-ended contracts with a number of general contractors and/or suppliers. These contracts allow the dam owner to hire equipment as needed at a set hourly rate. Materials could be purchased from any of the contractors.

### Potential Borrow Areas Around the Town

Potential borrow areas should be identified that could be utilized as sources of fill material in the event of an emergency condition at the dam requiring extra material. The owners of these and any other gravel pits that may be utilized during an emergency should be contacted.

**TABLE A.1: Contact List for Residences and Businesses in Forge Pond Dam’s Downstream Inundation Zone**

(To be filled out by EAP plan holder)

<b>Address</b>	<b>Phone Number</b>	<b>Notes</b>
23 School Street	N/A	Notify and evacuate
232 Batchelor Street	N/A	Notify and restrict access to low lying areas of the property
School Street at Batchelor Brook	N/A	Place barriers and establish detours
Trompke Avenue	N/A	Notify, evacuate and restrict access.
North Street at Batchelor Brook	N/A	Place barriers and establish detours
Porter Street at Batchelor Brook	N/A	Place barriers and establish detours
Aldrich Lake	N/A	Monitor conditions and implement the site’s EAP as necessary.

**APPENDIX B**

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**Emergency Detection, Evaluation & Classification**

## EMERGENCY DETECTION, EVALUATION & CLASSIFICATION

The detection, evaluation and classification of a potential emergency situation are crucial in determining the level of response and notification required in order to minimize the response time.

The following emergency classification system is proposed for this site:

- **Dam Safety WATCH: “Potential failure is developing”**: This is a situation where a failure may eventually occur if left unattended. This situation will require a Phase I response with continuous monitoring of the situation. This emergency classification level was formerly titled “Condition I”.
- **Dam Failure WARNING: “Failure is Imminent or has occurred”**: This is a situation where a failure either has occurred, is occurring, or is just about to occur. This situation will require Phase I and II responses that will proceed with evacuation procedures. This emergency classification level was formerly titled “Condition II”.

Examples of the preplanned procedures and notification that should be followed based on the various conditions observed during either storm or fair-weather conditions are outlined below. These are examples and are not intended to describe all possible conditions, nor are they intended to limit the actions taken during a given event.

### B.1 Dam Safety WATCH Examples

Notify: Dam owner, caretaker, EMD, Engineer, MA DCR ODS, MEMA, Massachusetts State Police

- Earthquake resulting in visible damage to the dam or appurtenances
- Other situations which may lead to damage at the structure
  - Evidence of vandalism
  - Bomb threat
  - A civil disorder near the reservoir
  - Any aircraft accident near the reservoir
- Water level of the impoundment is at an unsafe level and is rising, threatening to overtop the dam
- Discharges resulting in significant erosion and/or scour
- Any developing erosion, settlement, or upheaval occurring on the downstream slope or at the toe of the dam that is considered to be controllable
- Any undocumented leakage through any dam structure considered to be controllable

### B.2 Dam Failure Warning Examples

Notify: ALL PARTIES LISTED ON THE NOTIFICATION FLOWCHART

- Water has overtopped or will overtop the dam

- Uncontrollable erosion, settlement, or upheaval occurring on the downstream slope or at the toe of the dam
- Uncontrollable leakage through any dam structure resulting in degradation to the structural integrity of the dam
- A dislocation or failure of any structure which allows for an expanding, uncontrollable discharge of water through the spillway or dam, indicating a breach is occurring
- Dam is failing, is about to fail, or has failed

A Dam Safety Watch may be declared initially with gradual transition into a Dam Failure Warning or a Dam Failure Warning may be declared immediately, depending on the actual conditions.

While these actions attempt to generalize responses to the observed conditions, the judgment of the primary observer and/or knowledgeable person(s) must be utilized. While some conditions such as breaching, overtopping and severe piping can dictate an immediate evacuation, others will require the observer to determine the extent of the concern and the probability of the concern being addressed within a timely fashion.

### **B.3 Additional Guidance for Determining the Emergency Level**

Additional guidance will be provided as necessary.

**B.1: Possible Failure Modes**

Event	Situation	Emergency Level
Structural Cracking	New cracking along the concrete structure with radial, transverse, or vertical displacement	Watch
	New cracks in the concrete with seepage	Watch
	New cracks/old cracks with actively progressing displacements	Warning
Foundation Weakness	New cracks at the abutment greater than ¼-inch wide without seepage	Watch
	Cracks in the abutment with seepage	Watch
	Visual movement/slippage of the embankment slope	Warning
Construction Joint Cracking	Cracking at the construction joint	--
	Cracked construction joint with seepage	Watch
	Cracked construction joint with seepage and actively progressing displacements	Warning
Sinkholes	Rapidly enlarging sinkhole	Warning
Embankment Cracking	New cracks in the embankment greater than ¼-inch wide without seepage	--
	Cracks in the embankment with seepage	Watch / Warning
Earthquake	Earthquake felt within 50 miles of the dam	--
	Earthquake resulting in visible damage to the dam or appurtenances	Watch
	Earthquake resulting in uncontrollable release of water from the dam	Warning
Security Threat	Verified bomb threat that, if carried out, could result in damage to the dam	Watch
	Detonated bomb that has resulted in damage to the dam or appurtenances	Warning
Sabotage/Vandalism	Damage to dam or appurtenances with no impacts to the functioning of the dam	--
	Damage to dam or appurtenances that has resulted in seepage flow	Watch
	Damage to dam or appurtenances that has resulted in uncontrolled water release	Warning

- “--” signifies a non-emergency situation; an unusual event is slowly developing.
- \* “Watch / Warning” signifies that site-specific visual inspection is warranted and engineering judgement is required to classify the emergency level.

**B.4 Potential Deficiencies That Can Lead to Dam Failure**

The purpose of the section is to educate the user of the EAP as to some of the common causes of dam instability and possible failure. A short definition of each deficiency is listed along with typical causes. This is not intended to be an exhaustive list of all failure mechanisms as every dam has a unique set of conditions which will influence the development of conditions and concerns.

### 1. Flow Erosion

- Wash out of spillways, embankment sections.
- Causes: poor compaction of silt backfill; lack of riprap or concrete protection at interface between soil embankment and concrete structure; erosion by flow over embankment, spillway, or through outlet.

### 2. Embankment Leakage, Piping

- Excessive seepage resulting in internal erosion followed by formation of a “pipe” through the embankment, which once formed, causes rapid flow erosion and wash out of the embankment.
- Causes: poor compaction of soil along interface with concrete structures; tree root and rodent holes; inadequate or nonexistent filters between fine and coarse soils; cracks or voids within the concrete structure.

### 3. Foundation Leakage, Piping

- Wash-out of foundation material below dam causing undermining.
- Causes: poor interface with bedrock and concrete structures; excessive seepage at dam toe carrying soil with it.

### 4. Sliding

- Serious movement in foundation or concrete structure which either result in dam failure or significantly weaken the dam structure.
- Causes: foundation material weak; excessive water pressure in structure or foundation.

### 5. Deformation

- Gross deformation of dam or outlet structures resulting in immediate failure or cracking of the dam, and subsequent washouts.
- Causes: excessive settlement in foundation, ice jacking (pressure exerted by expanding/contracting ice structures).

### 6. Blowing of Trees from Embankment

- Blowing of trees on and near the embankment could result in substantial cracks and scour of the embankment and subsequent washout of the embankments.

- Causes: heavy rain associated with gusty winds and natural aging and poor root system of the trees on and near the embankments.

#### 7. Reduction of Crest Elevation

- Deterioration or washout of dam crest.
- Causes: poor concrete condition; heavy rain runoff.

#### 8. Dam Overtopping

- Water flows over the crest of the dam causing erosion and subsequently reducing dam height with time. If overtopping continues for any length of time it may lead to a total failure of the dam.
- Causes: heavy rain; blocked or inadequately sized spillway.

#### 9. Cracking

- Longitudinal cracking can be due to movements and/or settlements of the dam and can allow water to infiltrate the concrete.
- Transverse cracking can be due to horizontal and/or vertical movement and can result in a flow path across the concrete structure.
- Thin cracks can be very deep and intersect the phreatic surface.

**APPENDIX C**

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**Termination & Recovery**

## **APPENDIX C TERMINATION & RECOVERY**

If the EAP has been placed into action and the event has been deemed to not be an emergency, or the threat has been mitigated, termination of the emergency response under the EAP will be the sole responsibility of the incident commander. Termination process should include, but not be limited to, the following steps:

- Notify all agencies and parties contacted during the response of the situation termination.
- Issue public notification.
- Complete post-situation dam inspection.
- Implement post-situation recovery, including restoring impacted areas such that they are safe for public use and repairing or otherwise addressing damaged infrastructure.

**APPENDIX D**

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**Materials & Equipment**

## APPENDIX D AVAILABLE MATERIALS & EQUIPMENT

The Town of Granby should maintain a current list of contractors under contract or prequalified to complete work for the Town along with contact names, address, telephone numbers, and capabilities (i.e. material and equipment). Copies of the contracts as well as a schedule for contract renewals should be maintained in this section of the EAP.

The Town of Granby should maintain an updated list of available equipment from the local state park (if applicable) within this section. This list should include the location at which this equipment is stored as well as the status of the equipment (working, damaged, etc.).

Lenart Consulting Service, LLC has prepared an abbreviated list of contractors who have completed dam projects within Massachusetts for informational purposes:

Contractor	Phone Number	Locations
T Ford Company, Inc.	978-352-5606	Georgetown, MA
J.H. Lynch & Sons, Inc.	401-333-4300	Millbury, MA; other locations in CT & RI
New England Infrastructure Inc.	978-293-3535	Hudson, MA
WES Construction Corp.	781-294-1080	Halifax, MA
NEL Corporation	978-777-2085	Middleton, MA
R. Zoppo Corp.	781-344-8822	Stoughton, MA
S&R Corporation	978-441-2000	Lowell, MA
James A. Gross Contractors	781-862-7307	Lexington, MA
Northern Construction LLC	413-289-1230	Weymouth, MA; Palmer, MA
Maxymillian Technologies	413-499-3050	Pittsfield, MA
E.T. & L. Corp.	978-897-4353	Stow, MA
Charter Contracting Company LLC	857-246-6800	Boston, MA
Mark Santora PE Inc.	508-839-5113	North Grafton, MA

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**APPENDIX E**  
**Signoff Sheets**





**APPENDIX F**

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**Common Dam Safety Definitions**

## APPENDIX F COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR 10.00 Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA. Please note should discrepancies between definitions exists, those definitions included within 302 CMR 10.00 govern for dams located within the Commonwealth of Massachusetts.

### **Orientation**

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

### **Dam Components**

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

### **Size Classification**

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

Large – Structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – Structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – Structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – Structure less than 6 feet in height or having a storage capacity of less than 15 acre-feet.

### **Hazard Classification**

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

High Hazard (Class I) – Shall mean dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard (Class II) – Shall mean dams located where failure may cause loss of life, and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s), or cause the interruption of the use or service of relatively important facilities.

Low Hazard (Class III) – Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

### **General**

EAP – Emergency Action Plan – Shall mean a predetermined plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam break.

O&M Manual – Operations and Maintenance Manual - Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-Foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

**Condition Rating**

Unsafe – Major structural, operational, and maintenance deficiencies exist under normal operating conditions.

Poor – Significant structural, operation and maintenance deficiencies area clearly recognized for normal loading conditions.

Fair – Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory – Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good – No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

## **REFERENCES**

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## REFERENCES

The following references were utilized during the preparation of this report and the development of the recommendations presented herein:

1. "Design of Small Dams", United States Department of the Interior Bureau of Reclamation, 1987.
2. "ER 110-2-106 – Recommended Guidelines for Safety Inspection of Dams", Department of the Army, September 26, 1979.
3. "Guidelines for Reporting the Performance of Dams", National Performance of Dams Program, August 1994.
4. Commonwealth of Massachusetts General Laws, M.G.L. 253, Section 44, Chapter 302 CMR 10.00, Dam Safety, February 10, 2017.
5. Decision Support System for Water Infrastructural Security (DSS-WISETM) Lite [Computer Software], <https://dsswiseweb.ncce.olemiss.edu/index.php>, University of Mississippi, National Center for Computational Hydroscience and Engineering, November 8, 2016.
6. StreamStats, United States Geological Survey, <https://streamstats.usgs.gov/ss/>, accessed June 29, 2018. Peak flow regression equations were updated in 2017.
7. Phase I Inspection/Evaluation Report for Forge Pond Dam & Dike, Lenart Consulting Service, LLC, July 10, 2014.